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THE SCIENCE OF HUMANITY

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Of the Excellence of Humanity

Humanity is a favorite theme of poet and philosopher, novelist and historian, dramatist and moralist. The changes rung on the theme run the entire gamut of human feeling and thinking; its burden is caught in song and story and crystallized in books; and no sweeter strains have ever been sung, no grander scenes enacted, no nobler lines penned, than those fertilized by the touch of human (and solely human) nature that makes the whole world kin.

The chief subject of thought among all races is humanity in some of its numberless aspects; the chief part of the literature of civilized nations relates to humanity; the chief activities of all men are inspired by humanity. Yet—and this is a modern marvel—for the greater part the thought is vague, the literature random, the activity unorganized; *i. e.*, this most important of all subjects-matter and objects-matter in human ken has hardly been brought into the domain of that definite knowledge called Science. It is meet to inquire why this is so; and, to the end that the inquiry may be answered clearly, it is needful first to define humanity and then to consider what knowledge is and the way in which science has come to be; later the half-formed science of that which is proper to intellectual man and most important to his kind may be outlined.

Of the Purport of Humanity

According to the lexicographer, humanity denotes (1) the condition or quality of being human, (2) the character of being

[1] Vice-Presidential address before Section H of the American Association for the Advancement of Science, delivered at Detroit August 9, 1897.

humane, (3) the character of being well-bred, (4) mankind collectively, and (5) secular learning or literature.[1] The fourth of these definitions connotes Man—the genus Homo, object-matter of the broad science of anthropology—viewed in a distinct way, *i. e.*, as a mass or composite body rather than discrete individuals. The fifth definition connotes but a limited field in a vast domain, and is scholastic if not archaic; with this sense the term is chiefly used in opposition to divinity, often in the plural form (though there is good precedent for the use of this plural form in a more general and at the same time a more definite sense).[2] The first three definitions connote a wide range of attributes of Man which, albeit well recognized by all intelligent people, are rarely reckoned among the objects-matter of anthropology, seldom included within the pale of science; yet it is these attributes that especially distinguish Man and set him apart from the mineral, vegetal, and animal worlds, and exalt him above the rocks and plants and beasts of simple nature.

Although commonplace, these definitions are worthy of careful consideration, in that they summarize the substance of intelligent thought since the beginning of writing—indeed, since its own beginning in the remote, unwritten past—and particularly during the era of unprecedented intellectual activity and scientific progress dating from the issue of Bacon's *Novum Organum;* they carry the wisdom of the ages, and especially of these later days, during which wisdom prevails as never before. Viewed separately or in connection with contemporary definitions relating to mankind, they indicate general (albeit vague) recognition of certain specific attributes of Man, not as an animal, but as an ill-defined something known as a Human Being. When the history of thought condensed into the set phrases of the lexicographer is scanned, it is found that bitter controversy has been engendered by the diverse aspects of Man as seen from opposite sides; the disputants, like the storied knights of old, have admired the object, one as silver and the other as gold, and have done doughty battle in defense of their one-sided vision; the biologist, with eyes trained by observation and reason sharpened by long study of living things, sees the silvern side and sounds trumpet for man as an animal, while the littérateur and statesman and philan-

1 Condensed and rearranged from the "Standard" and "Century" dictionaries.

2 E. g., in "The Humanities," by J. W. Powell; Science, New Series, vol. 1, 1895, pp. 15–18.

thropist are half dazzled by the golden glory of Man as a thing supernal. The fair conclusion is that both are right as to what they see and both wrong as to what they fail to see; and in the light of this conclusion it is clear—if the general judgment of the body of thinkers is worth anything—that man has an animal basis on which a noble superstructure is borne. The definitions of the lexicographer, who voices the thought of the world, show that among general thinkers the idea of humanity prevails over the idea of animality, while the current literature of science indicates that the idea of animality is dominant in scientific circles—indeed, some writers on anthropology, the Science of Man, restrict the term to knowledge of the mammalian order Bimana, a limitation excluding the essential characteristics of Man as a thoughtful and emotional being and as an integral part of a collective and interdependent assemblage. Any attempt to harmonize these opposing ideas must begin with definite statement of the meaning attached to the essential term by more catholic anthropologists. So Humanity may be defined, by exclusion, as the condition or quality or character of possessing attributes distinct from those of animals, vegetals, and minerals; or, by inclusion, as (1) attributes or characteristics confined to human beings, comprising (*a*) the condition or quality of being human, *i. e.*, of acting, feeling, and thinking after the manner of human beings, (*b*) the character of being humane, and (*c*) the character of being well-bred; (2) mankind collectively; (3) secular learning and literature.

The supreme importance of humanity as thus defined is indicated by the fact that it is the foremost subject-matter of thought and speech and literature among all peoples, its prominence increasing from savagery through barbarism and civilization and culminating in enlightenment. The essential distinctness of humanity as thus defined appears when its serial relations to the other primary objects-matter of knowledge are considered: Just as living things rise above the mineral world by the possession of vitality, and just as animals rise above plants by the possession of motility, so do human beings rise above all other things by the possession of specific attributes rooting in mentality and maturing in the complex activities of collective life; or just as inorganic matter is the basis for the essentially distinct organic existence, so organic matter and processes form the basis for the essentially

distinct superorganic activities of human existence. The importance and distinctness of humanity are, indeed, such that it behooves naturalists to recognize a fourth realm or world—to extend science from the great realms of the mineral, the vegetal, and the animal into the incomparably broader and richer realm of the purely human; and this extension is the chief end of modern anthropology.

Of the Quality of Knowledge

Human Knowledge is constantly increasing. The body or aggregate of Knowledge is imponderable, and may not be counted or measured or weighed; yet it is an entity of prime importance and of universal recognition. Itself indefinite and varying from mind to mind, the sum of knowledge may be divided, albeit roughly, and analyzed, albeit crudely, and the days and years and centuries of its progress among men and peoples may be so studied that its tendencies and perhaps even the laws of its growth may be followed, albeit slowly and uncertainly. Although so indefinite, it is well worth while to try, and try again and still again, to analyze Knowledge and trace its progress; for Knowledge is the end and aim of intelligence, and human progress is measured not more by increase in knowledge of things than by increase in knowledge of Knowledge.

Many students have found it convenient to divide or classify Knowledge as individual and common, general and special, empiric and scientific, deductive and inductive, etc, according to the point of view; and these divisions are of use in that they represent first steps in analysis—though it is to be remembered that they are more or less vague or arbitrary, one or both. It may not be bootless slightly to extend this provisional analysis in order to trace more clearly the lines and stages in the growth of intellectual product.

For the sake of gaining clear ideas of relation, it is sometimes useful to project perception by the aid of mental imagery, and thereby to visualize the invisible in the eye of the mind. So the great aggregate of Knowledge is often likened unto a numerical sum, or a reservoir or river fed by many affluents; but a better figure may be found in scientific ideation, and the imponderable body may be pictured as an indefinite nebula or plasma, constantly growing by accretion and constantly undergoing internal

change. This plasma may best be portrayed as for the most part unorganized, with partially or completely organized nuclei and nodes and processes here and there; and there is a certain fitness in conceiving the organized tracts as near the surface, where the interactions between external and internal are direct and continuous. In this way the intellectual product of the world may be likened unto a nebula, a cloud gathering in a supersaturated solution, an ameba, or a brain—it may be viewed as a chaos more or less advanced on the way toward cosmos. The image is ideal; it serves merely as an aid in grasping and formulating widespread notions concerning knowledge as an elusive and intangible yet vigorously real and important Something; but it is not essential to correct understanding of the main facts in the growth of Knowledge.

Knowledge is born of the individual brain fertilized by indirect contact with other brains, and is given unto others with a degree of freedom varying with the disposition of the individual and the perfection of his mechanism for conveying thought—gesture, picture, speech, writing, printing; the growth of Knowledge keeps even pace with the acquisition of structures and devices for its expression, and it is a pleasant and significant fact that in general the disposition to dispense Knowledge grows strong and active just as the dispensing mechanism improves, though usually lagging a little behind—much as the verdure follows the vernal shower. So the stage of individual knowledge is initial, the stage of common knowledge consequent; so also individual knowledge is barren and unproductive until turned into the general fund to increase and multiply an hundred-fold; and so, too, there is progressive growth from the initial stage of individual discovery or invention, through many ill-defined yet successively higher and higher steps, well toward the mature stage of general possession. It is needful to observe that the body of general knowledge can never quite equal the aggregate knowledge possessed by individuals; although stimulated by others, each active individual knows something more than he is able to tell, be he never so free in disposition and facile in expression; and it is the never-ending process of coining and issuing and exchanging the precious product of the cerebral crucible that gives rise to intellectual property-right, and at the same time enriches the great plasma of Knowledge and maintains the activity essen-

tial to its existence. It follows—and this scientific certitude may be commended to a certain class of socialistic schemers—that the relation between individual knowledge and general knowledge is asymptotic, in that although the latter constantly approaches it never can reach the former; indeed if general knowledge were ever to overtake individual knowledge, through suspension of the laws of intellectuality (undoubtedly immutable as those of vitality), the special province of mental activity would be annihilated and the body of Knowledge would sink into quiescence—and, in the intellectual as in the vital, quiescence is death.

As Knowledge is produced and given unto others the freedom of giving is governed by numberless conditions, including the perfection or imperfection of the mechanism for expression, the avidity or indifference of the chosen beneficiaries, and the price fixed by custom; and so it happens that certain discoveries and inventions are directly communicated only to limited groups of individuals, who thereby accumulate special knowledge. In this way cliques and trades and guilds arise and the germ of caste is planted; in this way, too, specialists grow up through the indifference of the masses and their inability to keep pace with the investigator whose energies are directed along a single line; and eventually, among the most enlightened peoples, special societies are formed for the purpose of fostering or diffusing discovery and invention and thereby rounding out the fecund plasma of human Knowledge. It may be noted that special knowledge is nearly as barren and unproductive as individual knowledge, and is soon blasted by the poison of its own egoism, unless the richer part of its substance is guided toward the general mass—to do work as it advances, for it is by no means to be forgotten that the activity of the great body of Knowledge culminates in the province or zone of special knowledge, and that herein lies the leaven that leavens the whole.

During recent centuries and especially during recent decades specialists engaged in creating knowledge have studied Knowledge itself in the hope of learning its nature and origin; and most of these students have become convinced that the basis of real knowledge is found in the facts of the cosmos as revealed by observation or established by experimentation. So the acquisition of Knowledge begins with noting particular facts and advances to assembling or grouping these facts—*i. e.*, proceeds

from observation to generalization; the second process involves the elimination of the unlike or incongruous, and this leads to discrimination and to the recognition of analogies. In general terms and somewhat provisionally, it may be said that the analogies so recognized constitute laws of occurrence, which may themselves be generalized, and that the requisite discrimination of analogies leads to the recognition of homologies, or laws of occurrence and sequence combined; the framing of analogies and homologies being legitimate inference, which develops in hypothesis and matures in theory or doctrine to be finally formulated in laws or principles. Knowledge produced in this regular and simple manner is commonly called inductive, though there is always a deductive element coming over from that general intellectual possession by which even the closest specialist is guided in greater or less measure. Now it is to be noted that acquisition of Knowledge is largely spontaneous and unconscious—that apperception lags far behind perception, and that only the adolescent and mature among men and peoples are clearly conscious of their own mental processes, or indeed of the existence of mental process; it follows that most of the processes just outlined are ill-recognized or not recognized at all, even by the very makers of Knowledge. Moreover the later steps in intellectual acquisition are commonly the first to be consciously noted, so that the majority of men, even unto the present day, have failed to recognize the true source of real Knowledge, and have appealed to all manner of mysterious and extravagant sources for part or all of the intellectual wealth of the world; for while the more complex processes alone were recognized inference was exalted and observation was contemned, subtle imagining ran riot and overshadowed sober reason, and scholastic learning—which the practical makers of progress fortunately ignored or repudiated—grew into a labyrinth of deductions from vain postulates and hazy lucubrations. A new epoch dawned when Bacon formulated the inductive method—though he knew not that the method was old as the human mind, and that he but recognized that which all men do, whether consciously or unconsciously. Reviewing the course of intellectual acquisition from observation through generalization and inference and theory unto laws of occurrence and sequence, Knowledge may be classified by degree of development, and the simpler and

more primitive (whether burdened by assumption or not) may be called empiric, while the more definitely organized product of special study may be called scientific; and, remembering that the processes of acquiring Knowledge are partly unconscious, that portion which is organized unconsciously may be classed as common sense, or sagacity, or the wisdom of experience, while the consciously organized portion may be called science. This summary of the mode of organizing Knowledge may be trite, yet it serves to show that the methods of the student of Humanity are in no wise different from those pursued in the physical and natural sciences.

In brief, Knowledge is ever passing from the individual to the common and from the special to the general, and thereby its quantity is constantly increased and its utility extended; during recent times it is passing also from the empiric to the scientific, and thereby its quality is improved and its beneficence multiplied.

Of the Quickening of Science

When the history of the class of knowledge called Science is scanned, certain tendencies or directions of growth are perceived; and scrutiny shows that these tendencies are in harmony with the course of development of knowledge in general.

1. In general, observation and research begin with the rare or remote and proceed toward the common and the near. This tendency is revealed when the several branches of science are compared. Perhaps the oldest science is Mathematics, which began before history, so that its origin is obscure and cannot certainly be traced to definite objective basis; but the nearly contemporary and closely related science of Astronomy rested on observation of the celestial bodies—though the observation was long clouded by the mysticism of astrology. Then as wits were sharpened by mathematical research and astronomical observation, exact knowledge was gradually brought down to nearer bodies and under the guidance of every-day observation; and thus the science of Physics arose so gradually and inconspicuously that its early history is lost. Later, shrewd hermits and beldams wrought magic by means of rare substances, and alchemy grew up; and as time passed the manipulations were extended to common things and the ban of secrecy was gradually broken,

and so Chemistry arose. These four branches of knowledge concerning the inorganic interacted with mutual benefit, and for several centuries constituted Science, in contradistinction from the vast body of vague thought comprised in scholasticism and folklore, and from the more useful body of commonplace knowledge not yet consciously organized. Still later attention was attracted by things nearer to mankind in place and character, and first plants and afterward animals were studied systematically, and Botany and Zoology arose; but for a long time the most attractive organisms were the unusual and therefore striking, or the specimens brought by travelers from distant lands—indeed, even during the present half century, scientific museum administrators are embarrassed by the tendency of the collector to neglect the common and collect the unusual in his own locality, and it is only within a generation or two that the ordinary plants and animals supplying mankind with food and clothing and other everyday commodities have been subjected to scientific research. In like manner the science of Geology began, soon after botany and zoology, with the study of rare minerals and the ancient rocks of remote mountains; gradually the research extended to the nearer hills and valleys and the later formations; and it is only within the present generation that the soil-making deposits on which human life so largely depends have been brought under scientific examination. Last of all the scientific research beginning with the stars and passing to minerals and plants and animals, and through the soil on which plants and animals live, reached man himself; yet the studied observation began not so much with fellow-citizens or fellow-subjects bound to the student by ties of consanguinity and affinity as with the abject savage or half-clad barbarian of distant lands; and even today, and in the most enlightened nations of the earth, the pictures brought up in most minds by the term Anthropology are those of alien and inferior peoples, or of human curiosities and monstrosities exhibited in midway plaisances if not in circuses and dime museums. Even in scientific circles—yea, among those ranked as anthropologists—there are many who habitually restrict the term to the purely animal side of Man, and ignore that broader and nobler side which distinguishes mankind from all other things. So, whether Science be viewed in general or in detail, it is found that its progress is toward the ego—toward the everyday and

commonplace perhaps, yet ever toward the more important because the nearer, the more useful because the commoner; and the more nearly it approaches the more clearly it is seen that Science dignifies both student and object of study—that exact knowledge, with Midas touch, turns dross to gold.

2. In general, research begins with the abnormal and proceeds toward the normal: Judging from the habits of present-day barbarians, among whom the tempest is studied and the zephyr ignored, the comet remembered and the planet forgotten, the pre-Chaldean astronomers based their first celestial observations on the erratic wanderers rather than the orderly travelers of the sky; and in all ages prodigies—the bizarre and ill-formed, the gigantic and dwarfish—have been the first to catch and the longest to hold attention among casual observers and specialists alike. This tendency toward noting the abnormal, like that of regarding the rare rather than the common, is the easily besetting sin of the touring naturalist and local museum collector, the joy of the unscientific and the despair of the scientific among museum administrators. Clearly seen in geology and zoology and botany as the vestige of a primitive past, this tendency to perceive only the abnormal is still strong, indeed almost dominant, in the younger science of anthropology: today distorted or wounded or cachectic skulls from the ancient ossuaries of Africa or the huacals of Peru are esteemed far above normal crania of a normal people who have by normal activities aided in making civilization and ennobling the world; today the platycnemic tibia and perforate humerus of questionable significance are exalted above the normal members occupied in the march of progress and the conquest of lower nature; today there are a flourishing subscience called criminology and a fantastic fad of extolling and magnifying degeneracy, while the upright in mind and the sound in body are relatively neglected—yet this apparently morbid taste but reflects a tendency of the human mind, and is the promise of better things when the intellect awakened by the abnormal acquires the power of appreciating the normal. Unremembered millenniums of mystical shamanism were required to produce pathology and therapeutics, and centuries of pathology were needed to produce sound physiology and etiology, and in like manner there were generations of mystical and irrational psychomancy before students were able to recognize a basis for

the modern and most promising science of psychology. It smacks of the paradox to say that the beginning with the abnormal is the normal course in the making of science; yet the history of each and all of the sciences shows that observation on the abnormal has always led attention to the normal, just as observation on the remote has ever guided attention toward the near; and it is but natural that the youngest of the sciences should yet retain vestiges of undue magnification of the abnormal.

3. In general, scientific determination proceeds from the qualitative to the quantitative. This tendency is displayed by every branch of science, and so conspicuously that it may be deemed characteristic. It is in accordance with this tendency that estimate precedes weighing and reconnaissance goes before surveying; and it is under the same tendency that scientific progress involves constantly increasing refinement in observation and ever-growing accuracy in definition.

4. In general, scientific interpretation proceeds from the formal to the physical,[1] from the material or the inert or the static to the dynamic. The positions and movements of the moon and planets were determined with fair accuracy before Newton discovered that the paths of these and all other celestial bodies are fixed by gravity, when this discovery afforded the means for determining position and movement with incomparably greater accuracy. The physical and chemical effects of heat were recognized for generations, and were ascribed to the hypothetic element phlogiston, or the imaginary fluid caloric, long before Joule and others found it to be merely a manifestation of molecular motion; whereupon physics and chemistry were revolutionized and the forces of nature were gradually harnessed many times more effectively than before.

The ancients recognized vitality and ascribed it usually to a material something joined to the matter of the body: Some twenty-four centuries ago sagacious Heraclitus conceived life as a universal fire, and less than five centuries ago Paracelsus, and after him van Helmont, wrote of the anima mundi, or archeus, having in mind a vaguely imponderable thing akin to the so-called astral body which votaries of an oriental belief imagine themselves able to materialize out of the depths of transcendental reverie; two cen-

[1] As defined by Le Conte in a notable article "On the Structure and Origin of Mountains." American Journal of Science, third series, vol. xvi, 1878, page 107.

turies ago Hoffmann and other anatomists spoke habitually of the vital fluid as contemporary physicists of phlogiston; and within a hundred years leading physiologists, like Hunter, thought and wrote of the "diffused vital material." Less than a quarter-century ago Barker was deemed bold unto recklessness for undertaking to correlate vital and physical forces,[1] and many heads were shaken doubtfully when, in his presidential address before the American Association at Boston in 1880, the same brilliant experimentalist argued from the applications of Mosso's plethysmograph that mental force also may be weighed and measured, so that it must be regarded as interconvertible with other forms of energy;[2] yet half a generation of organic chemistry and physics has established these revolutionary propositions beyond peradventure and introduced a new era of biologic research.

The tendency toward dynamic interpretation is well shown, too, in geology: In the infancy of the science formations and the extinction of faunas were ascribed to extranatural cataclysms, the opening of valleys and the shaping of hills to ill-conceived or inconceivable catastrophes; with Lyell—a personal associate of scientific men now living—came the doctrine of uniformism, under which it is recognized that existing rains and rivers and silt-distributing waves are competent to produce the land-forms and formations of the earth, provided time enough be allowed them; the present generation of geologists, beginning with Powell and including two score others, have scanned the pages of the Great Stone Book so well laid open by Colorado and other rivers, and have learned to read earth-history from land-forms as well as formations, and have shown that at least a portion of those earth crust movements which were sheer mystery to Lyell result from the slow transfer of rock-matter by the action of running water. As interpretation grew definite and the mystery of earth-making dissolved, the classification gradually changed from chiefly material or static to chiefly dynamic; for a time the formations were classified by the processes of accumulation; and now the foremost geologists classify earth-science primarily by the great agencies of earth-making.

1 "The Correlation of Vital and Physical Forces," University series, number 2 (Van Nostrand), 1875.

2 Proceedings of the American Association for the Advancement of Science, vol. XXIX, 1881, page 12 et sequentia.

In anthropology interpretation has not yet grown definite and there are nearly as many modes of interpreting as there are men to interpret, yet even in the short and complex history of this youngest of the sciences the general tendency appears; for the earlier classifications were based on bodily or somatic features, while the more advanced among current classifications rest either on collective attributes or on the activities of the human groups—*i. e.*, the older classifications indicate what men are, the newer indicate what men do. Only half a generation past was it definitively suggested that human mentality is a form of energy, but already the testimony of the plethysmograph has been corroborated in so many ways and so widely extended that most scientific students of mental phenomena assume, either explicitly or implicitly, the essentially physical character of intellectual action; and in this writing it is assumed that intellectual energy is paramount in that it is able to control other forms of energy and make conquest of nature through invention and construction, and the faculties and works of man are classified and interpreted accordingly.

So in astronomy and physics and chemistry, and equally in biology and geology, the progress of Science may be measured by the ever-increasing recognition of the dynamic aspect of phenomena, of the physical forces by which the material things are moved; with the recognition of inherent energy or motion, observation progresses from the merely qualitative to the quantitative, and constantly increases in refinement; and in view of this progress in other sciences it can hardly be regarded as premature to attempt the extension of quantitative measure and dynamic interpretation to that side of anthropology which deals with the purely human attributes.

5. In general, scientific interpretation progresses from the stationary to the sequential; for the idea of action engenders the idea of succession: The Chaldean shepherd, the Egyptian soothsayer, and the Peruvian priest, like the earlier oriental astrologer, probably first took note of the celestial bodies as striking features of the cosmos, and later observed their rhythmic procession with such care that cycles were established and eclipses and other prodigies were foretold long before the true structure of the solar system was understood. These ancient observations and interpretations must have implanted that idea of the uniformity of

nature which has borne so splendid fruit during the present century; the budding notion found poetic expression in pleasing fancies of firmaments of crystal and the music of the spheres; yet it was not until the germinal idea was fertilized by the Newtonian law that the marvelous measure of celestial rhythm came to be known. Led by the planless experiments of daily toil, the mechanic—forerunner of the physicist—was the next to lay hold on the notion of uniform succession; it grew with the centuries and spread into the neighboring domain of chemistry, where it vitalized the dynamic interpretation of chemic union and aided in producing Avogadro's law, which, according to Cooke, "holds the same place in chemistry that the law of gravitation does in astronomy,"[1] and forms the basis of what has justly been called the New Chemistry. This law, like all others in science, afforded a means of prevision, or of presaging the unknown in terms of the known, and thus of testing its own validity; and as test followed test the idea of orderly succession grew until, with the aid of refined observation and the guidance of special experiment, it matured in the doctrine of the persistence of motion, the key-note of modern science. Here was a vantage point from which the astronomer was enabled to study the celestial bodies, especially our own sun, not merely as masses, but as chemical and physical assemblages; and so arose the line of research sometimes called celestial physics, but defined and dignified by Langley as the New Astronomy,[2] which has already afforded a means of analyzing the constituents and measuring the movements of several among the myriads of other suns than ours. True, each of these strides in the advance of physical science represents progressive appreciation of cosmical forces; yet still more fully do they represent progress in recognizing orderly sequence and causal succession in the movements of molar and molecular bodies.

Borrowing from physical science trenchant ideas concerning force and succession, even the earlier biologists analyzed the mechanism of living things and slowly stripped away the primitive panoply of mystery or divinity in which the infantile imagination, whether of men or races, has always enveiled vitality. Lamarck was one of the first to extend the idea of orderly suc-

1 "The New Chemistry" (International Scientific Series, VI), 1875, page 13.
2 "The New Astronomy," 1888, chapter 1.

cession to organisms, and although his special hypothesis of development has fallen into abeyance, it has features which anthropologists do well to remember; then came patient Darwin and doughty Huxley and studious Spencer with the definite doctrine of organic evolution, which spread from man to man and from land to land, producing the greatest and quickest intellectual revolution in the history of the world. Albeit revolutionary, the Darwinian doctrine was but the biotic complement of the physical doctrine of the persistence of motion; and the two doctrines are twin buttresses on which the symmetric structure of modern science is supported. Through the later doctrine the world and the things thereof were transfigured in a new beauty and perfection, the universe was invested with a new glory, and the narrow notion of breaks in the uniform course of nature by special fiat lost hold on the scientific mind forever.

It chanced that while the ferment of evolution was still fresh a trio of American geologists (Powell, followed by Gilbert and Dutton) entered the inspiring region traversed by Colorado canyon; and before their work was done the germ of geomorphy, or the New Geology, was planted—it was realized more clearly than ever before that the hills are not everlasting, but ever-changing, and that the features of every landscape tell an eloquent tale of continental evolution in which competent cause and commensurate effect follow ever in ceaseless succession through the eons of earth-making. The task of the geologist is not ended, indeed is only well begun; yet here, as in other sciences, the reign of law is realized and the day of appeal to chance is past.

When Huxley sought "Man's Place in Nature,"[1] and still more, when Darwin traced "The Descent of Man,"[2] the fruitful idea of the uniformity of nature was pushed into the domain of anthropology, and has now guided for a generation those branches of the science which deal with the animal side of Man; it is true that the rhythmic sequence of cause and effect has hardly been extended so far as to cover the delicate and elusive attributes of Humanity, but this extension is the motive of many investigators, the aim of the present writing. Already the broad realm of Humanity is fairly defined, and the distinctive form of developmental succession proper to this realm is fairly outlined, so

[1] First publication in 1863.

[2] The first edition of this notable work appeared in 1871.

that the distinctness of the science of human attributes has been made clear; for while stellar and molecular and organic development are evolutionary in that the main tendency of change is toward differentiation, the development of humanity is involutionary in that the main tendencies are toward integration and combination. Conformably to the fundamental facts of the great realms of nature, the earlier sciences are largely, perhaps chiefly, analytic, while the science of humanity is largely, perhaps chiefly, synthetic; and its votaries seem to find reason for figuring it as the central dome, crowning and conjoining the separate columns in the ideal pantheon of Science. If the confidence of the votaries is just, the youngest of the sciences may be expected to repay with interest all that it received from the several branches of knowledge whence it sprang. Already, indeed, it has thrown light on the course of organic development through researches on the human body, and has begun to guide the acquisition of knowledge through researches on the human brain and its functions; already it is contributing to the physical sciences—*e. g.*, through the refreshing Powellian doctrine of conservation, or of common persistence of motion and matter in the ultimate particle, whereby ideas concerning the mechanism of the universe would seem to be immeasurably simplified and extended; and there are other ways in which the youngest science is daily contributing to the stock of definite knowledge—their name is legion.

So it is that science has always progressed from the rare to the common, from the remote to the near, from the abnormal to the normal, from the merely qualitative to the quantitative, from the merely material aspect to the physical aspect, from the primitive faith in fixity to living realization of causal succession. At first sight this progress may seem puzzling, even paradoxical; yet the general course is but an expression of the order of intellectual operations pursued in scientific research: The first step is observation, which is easy when the objects observed are isolated or distinct, increasingly difficult as the objects increase in number and similarity; the second step is generalization, which is relatively easy when the objects examined are few, relatively difficult when they are many; while the ancillary process of discrimination of the incongruous likewise grows laborious with the multiplication of objects and similarities. Accordingly, it is easy to

study the rare, the remote, and the abnormal, and as faculty is strengthened by exercise it gradually becomes easy to progress toward the common, the near, and the normal. So also qualitative determination is easy, quantitative determination difficult—indeed exact quantitative work is impossible without careful training, as numberless surveyors and teachers can testify. In like manner interpretation in terms of the material, coupled with appeal to the supernatural when obstacles are encountered, is relatively easy and characteristic of the indolent or immature mind, while the firm grasp of analogy and homology, and the clear recognition of energy and sequence, require both native capacity and systematic training. Accordingly scientific interpretation in terms of action and succession is the end of mental effort, and may be regarded as the highest expression of intellectuality. This correspondence between the method of research and the history of Science throughout the centuries amply attests the excellence of the method. Yet it is not to be forgotten that just as intellectual grasp strengthens so interpretation is simplified, partly through the elimination of that question-begging mysticism which pervades all primitive philosophies, partly through clearer arrangement of facts and relations; and as interpretation grows simple three especially noteworthy effects follow: (1) Each step in interpretation makes the later steps easier; (2) as the labor lightens, more energy is left for the next task, and the mind of the student pushes into new fields of study, and from time to time organizes new branches of inquiry; and (3) with each extension of inquiry mental faculty is stimulated and strengthened. These tendencies are clearly indicated by the birth and growth of new sciences recorded in the history of research; beginning with the celestial bodies, it has extended to mechanical bodies, vegetals, animals, the earth itself, then to the human body, individual and collective; and now it is reaching out toward the special attributes of mankind, the things nearest to human welfare and happiness.

Of the Sciences of Animal Man

The domain of anthropology is vast, and, partly by reason of its very magnitude, is sometimes deemed indefinite; yet in the light of the history of science in general its limits and subdivisions may easily be outlined.

History and analogy combine to show that the study of Man began with wounds and diseases and grew into surgery and medicine, which were at first thaumaturgic, but gradually became rational or scientific;[1] and in this way definite knowledge of the human body gradually accumulated and Anatomy and Physiology, with various ancillary sciences and subsciences, took form and function. Meantime the organs of the human body were compared and identified with those of beasts and birds (which were long the better known), and comparative anatomy was established; but it was not until observation and generalization were fertilized by scientific zoology that the study of structures in their functional aspect took shape in Morphology. Under the influence of humanitarian therapy and the unprecedented stimulus of the Darwinian doctrine of development, the investigations of the last century, and particularly the last quarter-century, have extended from structures to functions, and these, through the fruitful science of Embryology, to human ontogony and phylogeny—to the individual and generic evolution of Man considered as an animate organism. Accordingly there are several branches of science which deal alike with the human organism and the various other animal and even vegetal organisms of the great vital series in which Man is usually, though not invariably, considered the culminating and crowning form. Here anthropology and biology blend; but it is convenient and desirable to distinguish that division of the Science of Man which deals with the organic features of the order Bimana, and this science or subscience is frequently called *Somatology*. Although the oldest and the simplest among the divisions of the anthropologic sciences, Somatology comprises various special branches of knowledge commonly classed as sciences, including Pathology, Physiology, Etiology, etc, representing the specific methods and purposes of particular classes of investigators.

The early books and maps of civilized nations show that explorers and pioneers were profoundly impressed by the far-away peoples encountered in their wanderings; there are not only accounts but pictures of headless men with faces in their chests, of cyclops with single eyes set skyward, and of other impossible

[1] The genesis and development of surgery, and incidentally of medicine, are discussed in a memoir on "Primitive Trephining in Peru," Sixteenth Annual Report of the Bureau of American Ethnology, 1897, especially on pages 19 and 72.

monstrosities in human semblance; even since zoology became fairly definite, accounts of ten-foot giants in Patagonia and three-foot pygmies in central Africa and other lands remote or hidden have gained currency and credence. As exploration continued, the unconscionable extravagancies of vision were gradually corrected, and the explorers came to see alien races in proper form and something like proper stature; yet the interest in the stranger peoples remained unabated and led to systematic observation and record. Borrowing methods from biology, the observers or their interpreters sought to classify the men of different continents and provinces and islands by somatic characters—by stature, color of skin, color and texture of hair, color and attitude of eyes, form of feature, form and size of skull, peculiarities of long bones, etc.; and, as the researches became definite and fruitful, they were combined in a science of races, called *Ethnology*. This science has much in common with biology, and is a direct outgrowth from that group of sciences pertaining to the human body combined under the term Somatology.

After centuries of unscientific and unsuccessful search for the seat of the soul through baseless deduction and blind introspection, certain thinkers began to profit by contemporary researches in anatomy and physiology; and as eye and mind were trained—even as the eye and mind of the traveler were trained not to make monstrosities out of unfamiliar races—the form and function of the nervous system were gradually recognized, and the dominance of the brain was finally established. Only within a generation or two has the brain been investigated in a scientific way and with due appreciation of the importance of that marvelous structure preformed in the articulates, potentialized throughout the long line of vertebrates, and perfected in the ultimate mammalian form of the genus Homo; yet during the present quarter-century the research has been organized in a science already cultivated in many lands and taught in most of the leading universities. The earlier promoters of this science approached the subject haltingly from the speculative or deductive side, and perhaps for this reason the science is named, not so much from the organ itself as from its product, *Psychology*. This modern science is not to be confounded with certain fantastic notions sometimes foisted under the same designation, which do little more than obstruct progress; the parent stock of the science was, indeed, speculative—as is most

knowledge in the beginning—but so soon as the graft of Somatology was affixed it became fruitful. It is to be noted that while Somatology is essentially biotic and Ethnology is biotic in so far as it rests on bodily features, Psychology pushes beyond the domain of biology proper, partly in that the human brain owes its perfection of development to the essentially human attributes, partly in that the science, as commonly defined, embraces both brain and mind—both organ and product.

So there are three well-established and widely recognized sciences whose object-matter is Man considered as an organism. By some students—especially those of past decades—they are held to constitute the whole of Anthropology; by others they are combined as Physical Anthropology and regarded as including only the animal side of Man but excluding nearly the whole of the essentially human side—nearly but not quite the whole, since the field of Psychology is common ground. This is the view of several modern anthropologists, and is that held in this writing.

Of the Potency of Devices

Passing from that portion of the domain of Anthropology which deals with Man as an animate genus, there is found another and still broader portion occupied by that which Man does as a sentient, volitient, and intelligent being; it is true that this portion of the domain is less definite than the other, yet in the light of intellectual progress its limits and subdivisions also may be outlined, albeit in some measure provisionally.

The early explorers who came home laden with travelers' tales sometimes brought also more tangible cargo in the form of strange wares; and so the handiwork of the world gradually came under the observation of students, and in time museums were built largely to accommodate the constantly increasing collections of primitive and alien arts. Meantime observent persons in many lands were attracted by relics of archaic culture in the form of implements, weapons, ornaments, apparel, and habitations, as well as burial places sometimes containing the bones of the ancient artisans; and these, too, were collected, and museums were built to accommodate them in connection with the artificial material gathered among the living peoples of distant lands. As collectors and collections multiplied the work was organized; and although the initial stimulus came from observation in re-

mote countries the interest grew inward—as is the way of advancing knowledge—and the local research for the rare relics of past ages was the first to receive name and character as the science of Archeology. As observations multiplied resemblances were found between the culture-products of remote times and remote places; the arts of primitive peoples were found to vary in a manner corresponding more or less closely to race; and thereby ethnic research gained new impetus and served in turn to guide research in the prehistoric. So Archeology and Ethnology became mutually helpful and grew apace and came to be intimately associated in most minds, despite the fact that the one is concerned primarily with what man is, the other with what man does; and in some circles these branches of inquiry came to be regarded as constituting the whole of Anthropology.

At first the products of ancient and alien handiwork were accepted at their token value, much like the chemic elements before Avogadro, the planetary movements before Newton, our sun and others before the doctrine of the persistence of motion, the organic species before Darwin; but within a generation or two it has come to be realized that they possess an innate value as exponents of intellectual activity—as medals of human creation, collectively attesting the birth and growth of discovery and invention, design and motive, and all other human faculties. Perhaps the time has not come for defining this stage in the progress of anthropology; it may be that the transition is not yet complete, or that the relations are too complex for easy grasp; yet it seems clear that when the anthropologist first saw in the implement of shell or stone an index to the mental operations of the implement-maker hardly less definite than the written page to the thought of the writer, the Science of Man rose to a higher plane with a bound comparable to those marking great epochs in the development of the other sciences.

Now in Science each advance gives a new standpoint from which a broader view may be gained, and with the recognition of what may be called the dynamic aspect of artificial objects, the way was prepared for further progress. It was soon perceived that the simplest devices are supplements to or substitutes for bodily organs—that the knife of shell or tooth or stone is a supplement to teeth and nails, that the hammer-stone multiplies the efficiency of blows, and that the missile is equivalent to an in-

definite prolongation of reach; and accordingly it was realized that, in so far as he is a maker and user of implements and weapons, even the lowest savage rises above the plane of purely animal life. It was next perceived that even the simplest devices react on the organisms in various ways: The substitution of the shell knife for nails and teeth diminishes the exercise and hence the vigor of these organs, and removes them from the category of characters subject to development through the survival of the fittest in the strife for existence, so that in so far as he employs devices in lieu of organs the savage passes beyond the realm of organic development by natural selection; at the same time the exercise of making and using artificial devices in lieu of natural organs tends to develop distinctively intellectual or cerebral characters; so that the effect of competition in the use of devices is not only to remove Man from the realm of the biotic, but to set him on a definite course of development in a new realm—the realm of the artificial, or essentially human. As the view of the artificial continued to broaden it was perceived that while the simpler devices may appertain to individuals, they are not integral part of the individual like the organs which they supplement, but may and do pass from hand to hand and from group to group; also that the use of a device by one person prompts others to acquire and use similar devices, which they are able to do immediately through mere exercise of individual volition (rather than slowly through generations of natural selection), so that each discovery or invention is at once the germ of a line of devices and a stimulus to intellectual power; and thus it was recognized that there is a strong communal tendency in the realm of the artificial—that the development of devices tends toward interchange and coöperation, yet ever of such sort as to augment intellectual power and elevate the human above the subhuman.

In the light of the dynamic interpretation of devices it is easy to perceive the trend of superorganic succession, or development of the artificial, and to contrast it with the course of biotic evolution: The substance or substratum of the latter is living matter, that of the former any matter, living or dead, with which man chooses to deal; the mode of this is slow elimination of the unfit and unpremeditated survival of the fit, the method of that is immediate imitation and designed improvement of the ingenious; the tendency of biotic evolution is toward organic dif-

ferentiation, that of artificial development mainly toward organic persistence with endless multiplication and integration of devices; the effect of the one is individual or egoistic, that of the other communal and altruistic. With the recognition of the dynamic and successional aspects of artificial devices, anthropology gained a new significance; for to its objects-matter in the form of the human body and human races and the human brain there was added the whole series of artificial devices and the exceeding potent intellectual activities which these devices represent—and this addition is the basis of what is here styled the Science of Humanity.[1]

Of the Activities of Man

When artificial devices were interpreted in terms of activities a new classification of human handiwork arose. At the same time the activities themselves became objects of research, which soon passed beyond the collections and extended to the multifarious material devices in daily use among living peoples in the various stages of civilization from savagery to enlightenment; still later the research was extended to the intellectual or non-material devices which preëminently distinguish mankind, such as law, letters, and learning in their numberless aspects. The study of the activities is now sufficiently advanced to indicate, at least provisionally, their relations among each other and to the merely organic processes; they may be arranged in the order of their affinity with the vital.

1. The primary activities of mankind are connected with more or less spontaneous sensations of pleasurable character. They arise and expand in fairly definite order; among known primitive peoples they appeal chiefly to the senses, and among more advanced peoples they appeal largely to the emotions and the purely intellectual faculties; they root in sports, games, and decorations, and mature in the fine-arts of painting, sculpture, the drama, poesy, and music—*i. e.*, they constitute the esthetics. The artificial devices growing out of these activities go far toward

[1] The enlargement of the domain of Anthropology as here set forth is regarded as marking the most important epoch in the development of this science, one of the most important in the history of Science in general. Several investigators have contributed to it; perhaps the earliest, one of the most voluminous, and certainly the most original of these contributors is J. W. Powell, whose preliminary writings have appeared in a large number of addresses, official reports, and minor papers, though his final conclusions are not yet published.

filling those museums of the world devoted to archaic and ethnic material, and nearly a third part of current anthropologic literature is devoted to this class of objects and the activities which they represent. The activities and activital products form the objects-matter of a broad and fruitful field of inquiry known of late as *Esthetology.*

2. Intimately connected with the primary activities, and also originating in spontaneous vital processes though becoming dominant only by organization through exercise and volition, there are other activities tending toward the maintenance of physical welfare. From a simple beginning in occupations akin to those of the beasts, they arise and expand with each step in cultural advancement from savagery to enlightenment; at first confined to food-getting, they extend also to the making of apparel, the building of habitations, and eventually to the supply of intellectual demands—*i. e.*, they constitute the industries of common parlance. The material devices growing out of the industrial activities have enriched anthropologic museums almost equally with those growing out of esthetic activities; and probably a fourth part of the current literature of Anthropology is devoted to them and the activities by which they are produced. Together they form the object-matter of a large and rich science commonly called *Technology.*

It is to be noted that the greater part of the material investigated by the archeologist pertains also to the fields of Esthetology and Technology, though these are far broader in that they extend not only to a greater variety of activital products but to the activities themselves. It may also be noted that both esthetics and industries, originating as they do in vital processes, are primarily individual, though they become collective partly through combination with higher activities, while the higher activities of the series are primarily collective. It is noteworthy, too, that the two lower classes of essentially human activities rest on a material basis and are represented primarily by material devices, while the activities of higher planes rise above the material in their essential character and are only incidentally represented by material devices.

3. The activities of the third class are connected with collective relations; and since they grow out of consanguinity or family relation they may be said to have a biotic germ. In general,

the products of these activities originate as customs, which grade into regulations and later into laws, and are perpetuated in tribal, national, and other institutions. The activities and their products are most intimately connected with, and indeed form the chief basis of, cultural progress: In the first culture stage, corresponding to what is commonly called savagery, the collective or social relation is based on kinship traced in the maternal line; in the stage commonly called barbarism, social relation rests on kinship traced through the paternal line—these stages forming tribal society. In the third stage the social organization passes from patriarchy through feudalism, or an equivalent intermediate condition not yet formulated, to that stage of individual property-right in lands and goods which is commonly called civilization; and men are now passing into the stage characterized by intellectual property-right which is commonly called enlightenment—the organization in the last two stages being essentially nonconsanguineal and constituting what is sometimes called national society. The several activities and activital products belonging to this class form the object-matter of a fecund science commonly called *Sociology*—though the day of final agreement concerning the definition of the term is not yet.

4. In some measure the activities of the fourth class are an outgrowth of those of the third, since, although essentially superorganic, they may be regarded as a means of establishing and maintaining relation; they comprise expression, pantomimic, oral, and graphic. Like the other activities, they arise and expand in a certain order; beginning with what is somewhat incongruously called gesture-speech and with rudely articulate language, they mature in oratory and writing; and it is significant that the lines of development, so far as ascertained, run counter to those of biotic evolution in that they are almost wholly convergent instead of divergent, so that these activities pertain, in every essential respect, to the superorganic realm of Humanity. The principal activities are speech and writing; the tangible products are legend and literature; but the rich and ever-growing content of these products is Knowledge. The activities of expression and their products are commonly combined as the object-matter of another science frequently called *Philology*, though in this case, too, there is diversity in definition and also in designation.

5. There remains a class of elusive and protean yet immeasurably potent activities which come so near the ego and are so hard to grasp and difficult to convey that it would seem almost hopeless to attempt to define them; they are the essentially intellectual activities which form the motive and burden of expression, and their products comprise beliefs, opinions, knowledge, wisdom, and all other purely intellectual possessions. These activities also arise in a definite order, which is set forth incidentally in earlier paragraphs; and by most systematic thinkers they are considered to mature in Science. The activities and their products are so obscure and so diverse that they have not been combined and named in the vernacular; yet they are by some students regarded as the object-matter of one of the broadest of the special sciences, *Sophiology*.[1]

So there are five classes of essentially human activities and activital products, each so rich in phenomena and principles and so far distinct from all other classes of things as to constitute an adequate basis for a science; they are the fine-arts or esthetics, giving basis for Esthetology; industries, forming the object-matter of Technology; organizations or institutions, affording foundation for Sociology; language and literature, with their science of Philology; and the great plasma of Knowledge, forming the ill-defined but all-important object-matter of Sophiology. The five fields of research pertain primarily to Man and thus represent Anthropology; yet even casual survey of their extent and character renders it evident that they pertain not at all to the animal side of Man but wholly to that side which intellectual man alone possesses—they are five sciences of Humanity. Partly to distinguish them from the three distinct branches of knowledge concerning animal man, partly to fix their place in the body of Knowledge, they have recently been combined under the term *Demonomy;*[2] and this system of organized knowledge concerning wholly human things may fitly be designated the greater Science of Humanity.

Of the Potency and Promise of the Activities

As knowledge arises it is applied to the promotion of happiness and welfare; this has been true of unorganized and uncon-

1 Sixteenth Annual Report of the Bureau of American Ethnology, 1897, p. xviii.
2 Fifteenth Annual Report of the Bureau of Ethnology, 1897, p. xix.

sciously organized knowledge throughout the history of mankind, and is especially true of definitely organized knowledge, which thereby becomes applied science. Now, knowledge concerning the human activities, even while unconscious or sub-conscious only, reacts upon and shapes the activities in such manner as constantly to increase their potency. Some of the ways in which the science of humanity stimulates and strengthens human activities are especially noteworthy:

1. While the great domain of Anthropology is divisible into an animal side comprising three broad sciences and a human side made up of five still broader fields of research, other classifications are possible, and indeed of special utility when directed toward the practical application of the science to everyday affairs—for any assemblage of facts and relations may be classified in as many ways as there are purposes of classification. Experience shows that there is a peculiar advantage in classifying certain sciences by method of research rather than by the objects under investigation. Classified in this way, anthropology comprises (1) demography, *i. e.*, the enumeration and description of men, activital products, etc.; (2) human geography (or anthropogeography) dealing with the geographic distribution of peoples and their artifacts; (3) political economy, which is concerned primarily with applied social forces and their products; (4) history, which deals with the rise and fall of peoples and nations; and (5) philosophy, which scrutinizes materials and forces and sequences, and seeks the causes of growth and decadence among human things. This classification traverses the same domain as the more general one, and serves to bring out the same facts and relations in somewhat different light; *i. e.*, it is artificial rather than natural, technical rather than logical, subjective rather than objective, directive rather than creative—in brief, it pertains to applications rather than original research. For certain purposes it is desirable to combine the classifications and define special fields of inquiry by the coincidence between the two, as has recently been done happily by Giddings[1] and others; for the lines of thought represented in the two systems are strengthened by interaction—the one represents science, while the other may stand for statecraft or learning, and the two combine to advance mankind in knowledge and power.

[1] "The Principles of Sociology," 1896, page 49.

2. At the outset the science of ethnology was closely affiliated with zoölogy, representing indeed little more than the concentration of biologic inquiry on a single order of animate organisms; but with the recognition of human activities, this science was raised to a new plane. The applications of demonomy in the classification of peoples and races are many and sweeping: already the natives of the western hemisphere are classified primarily by language and incidentally by other demotic features rather than by any or all biotic characters; already the great stages in human progress from savagery to enlightenment are seriated in terms of social organization in lieu of those of the bodily features with which the biologist is wont to deal; already the present-day ethnologist gives first thought to the arts, industries, institutions, languages, and ideas of the races rather than to any or all of those individual features comprised in stature and form and color; already indeed the recognition of human activities and the course of human development has served to revolutionize the science of races no less completely than the older sciences were revolutionized by recognition of force and sequence—and just as the New Astronomy, the New Chemistry, and the New Geology are distinguished, so it is meet to distinguish a New Ethnology as a science of artificially organized groups rather than of mere upright animals.

3. With the rise of knowledge concerning activities, it was perceived that the primary function and ultimate end of devices have always been to extend and increase human power, to enable man to control plants and subjugate animals, and to evade or utilize sun and storm—*i. e.*, to make conquest of lower nature; accordingly it was recognized that, while the human characters reflect environment measurably, as the purely biotic characters do fully, it is the essential tendency and character of man to control, rather than to be controlled by, his environment. This human power did not spring into being full-fledged—indeed science knows no Minervan birth—but grew up slowly through the exercise and gradual strengthening of volition and the evolution of design; so primitive peoples are partially controlled by their environment, while the control diminishes with successive culture stages up to that of enlightened man who dominates by multifarious devices nearly every physical force. Examination of the successive stages in emancipation from envi-

ronment brings to light many significant relations; thus it is found that when two or more primitive peoples of similar culture are subjected to similar conditions of environment their minds respond in similar ways, so that similar devices are discovered or invented; and recognition of this law of human progress has served to correct some of the most persistent misapprehensions by which anthropology, like all other sciences in their infancy, has been burdened. At the same time the recognition of progressively increasing conquest over the inorganic and the organic merely has served to define and dignify man's estate at the head of all nature.

4. Although certain human characters and characteristics were already under investigation, it can hardly be said that mankind in general came into the domain of scientific inquiry until the Darwinian doctrine of evolution was accepted; accordingly, anthropologists at first regarded Man as subject to the law of organic development through the survival of the fittest. Then came the recognition of activital development in contradistinction from organic development; and the pendulum of opinion swung back so far that most modern anthropologists implicitly assumed the human form—the form of the order Bimana, genus Homo, and species sapiens—to be fixed and final. It now appears that the pendulum swung too far; for a long series of highly significant yet but half appreciated observations indicate that, just as the human mind dominates the materials and forces of lower nature, so may it measurably control and fashion the organism in which it is embodied: already hygiene and gymnastics have improved unnumbered physiques and lengthened the days of thousands; already leading educational institutions maintain physical departments in which they undertake so to shape and strengthen the limbs and lungs and even the heart and bone of the matriculate that he may be graduated sound in body as strong in mind—yet these indications would seem only to point the way of progress and promise still better things in human development as later generations rise.

5. The most elusive attributes of humanity are those manifested in conduct and feeling and thought; yet, paradoxically, it was these obscure products of intellectual activity that men first sought to guide and control—for in every generation in each stage of culture, from the lowest savagery to the highest enlight-

enment, parents have essayed to train their children, while first the tribal leaders and later the sages and statesmen have semi-consciously or in full consciousness striven ceaselessly to shape the minds of the masses. So education, or the voluntary control of individual mentality for the common good, has affected profoundly the entire course of human development, and has served ever to widen the chasm separating man from the beasts. In the earlier stages of culture, as indicated by the customs of savages still living, education was limited to the lowly esthetic and industrial activities of the prime; for the primitive thinker ascribes motive, complex feeling, and all but the simplest actions to ill-conceived extraneous potencies against which it were bootless to strive. In higher savagery and in barbarism, the sphere of education extended to those features of conduct involved in the maintenance of tribal relations, and was effected partly by means of habitual appeal to the extraneous potencies, which were gradually crystallized in mythic systems themselves arising in a certain order determined partly by educational practice; for in much of savagery and in all of barbarism the sources of sentiment and motive are sought outside the individual and largely beyond the realm of the real. With the birth of civilization, education extended to feeling and thought, partly through appeal to ideal potencies, and there was a tendency to exalt the esthetic and neglect the industrial; and certain educational systems rose so high into the supernal or passed so far into the metaphysical as to lose sight alike of individual conduct and of the sources of real knowledge. In modern enlightenment—especially in America—the methods and purposes of training are shaped by science, and, despite the struggles of the scholastics, education is becoming revolutionized: With the recognition of an actual universe, knowable through sense and reason, training becomes definite in plan and useful in purpose; with the recognition of cerebral functions and of the influence of exercise in developing the brain, the scientific psychologists of the present decade have gone far in erecting a new platform for pedagogy; and with the recognition of the relations among the activities and the activital products of man, the normal course of intellectual development would appear to have been made clear—for it seems manifest that just as observation begins with the simple and proceeds toward the complex, and just as activity begins with

the spontaneous and passes into the volitional, so individual and collective mentality must arise in simple and perhaps spontaneous action, to grow through habit into sentiment, and to mature through unconscious or conscious thought in definite motive. It is heterodox, perhaps in more senses than one, to affirm that motive—the noblest character of humanity—buds in spontaneous action, blossoms in subconscious habit, and attains fruition in the highest intellectual activity (whether unconscious or conscious) of which the individual or group is capable; certainly the affirmation represents complete inversion of a notion prevalent in savagery, dominant in barbarism, and gradually weakening through civilization; yet it is sustained by all that is known of the processes of acquiring knowledge, by the history of the growth of knowledge in general, and, indeed, by nearly all applied statecraft and most applied priestcraft throughout human history. The recognition of the genesis and antecedents of motive must afford a vantage point for a clearer survey of the vast field of human emotion, affection, passion, aspiration, disposition; and, at the same time, it cannot fail to give a key-note for improved education—for the still more complete control of Mind.

These are but a few of the many ways[1] in which the great science based on human activities tends to bring order out of that vast chaos of action and thought which has so long resisted analysis and synthesis—that last citadel of the unknown.

And briefly of the Basis and End of the Science of Humanity

Hitherto Humanity has been the theme of poesy and romance rather than of sober science. All men have perceived that their kind possess attributes distinguishing them from the rocks and plants and beasts of lower nature, yet for the most part these attributes were either ignored or transfigured into a dazzling halo which defied analysis none the less by reason of its subjective character; even today and in the most enlightened circles of the most enlightened nations there are few willing to consider, and content to consider dispassionately, the purely human attributes; but to these few the chaos of industries and ideals, of emotions

[1] One of these is the control of society itself for the common good, as shown by Ward in his masterly memoir on "Dynamic Sociology," which it must suffice to mention merely.

and passions, of conduct and motive, and of all other things human, falls into a simple order nearly as definite as the order recognized in each of the older sciences—the order of human activities and activital products.

Exact knowledge began with the remote and progressed toward the near; with every stage of progress it has been a power for the conquest of natural forces and conditions, has exalted brain-moved mankind above all brainless or small-brained creatures, and has made continually for human welfare and happiness; and now that the methods and purposes of science are extending to the human body and brain it cannot be doubted that these, like all other material things, will be controlled and reconstructed for the good and the glory of intelligent Man. This is the end of the Science of Humanity.

A PRIMITIVE MAYA MUSICAL INSTRUMENT

M. H. SAVILLE

The ancient forms of musical instruments known to have been used in Yucatan have been almost entirely superseded by those introduced since the Spanish conquest, and the sound of the accordion and the twang of the guitar are now to be heard in every village. In some of the interior pueblos the *tun-kul*, or ancient wooden drum, is still used on feast days.

During the winter of 1890–'91, while engaged in explorations at the cave of Loltun on the hacienda of Tabi, we employed a number of Mayas who came from various small villages in the interior of the country, remote from Spanish influences. Camping near one of the entrances of the cave, their evenings were passed in singing plaintive melodies in their native tongue, accompanied by a primitive form of stringed instrument which I have never seen described. This instrument, called *hool*, is made by stretching a piece of rope-like vine, called *ohil*, between the two ends of a pliable piece of wood, making a bow about two feet in length. One end of this bow is placed near the face, about one-third of the distance from the end, so that the mouth covers but does not touch the string, forming a resonator. Between the string and the bow a piece of wood is placed in such a manner that it may be pressed against the string or relaxed at